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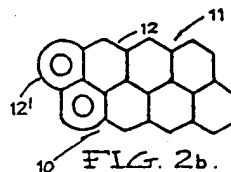
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(54) Pivotaly linked rigid cell chains.

(57) Apparatus for propagation of plant seedlings including a cell chain comprising a series of cells (12) rigidly connected to form a group of aligned cells (10, 11) each group being connected in pivotal relation to another group by a link cell (121) to form a continuous chain of cells able to be mechanically handled by transport devices or concertined into a solid block of cells having little or no wastage of space.



IMPROVEMENTS RELATING TO CELL CHAINS

The present invention relates to connected individual cells intended for use in the mechanized propagation of seeds and the handling of plants propagated therein. In particular the invention relates to a cell as  
5 described in our Australian patent specification No. 516,117.

These connected individual cells are commonly known as "cell chains". Cell chains are known wherein the cells  
10 are each tubular cylindrical constructions of substantially uniform cross-section with pivot connections formed between adjacent cells. These chains are moved between desired locations by drive sprocket wheels engaging essentially  
15 between the tubular cells with the open face of the cell directed upwardly to receive propagating material and a seed. While these cell chains are effective in operation they do suffer from certain practical disadvantages. Cell chains of this type because of their pivot arrangements  
20 between cells are stored in a circular spiral manner which take up considerable space both between individual cells and by the fact that a circular array of cells leaves substantial areas which cannot be occupied by cells.

The objective of the present invention is to provide a cell chain arrangement which will overcome or  
25 substantially minimize the aforementioned disadvantages of known arrangements.

According to a first aspect of the present invention there is provided an arrangement of interconnected individual cells for use in the propagation of seeds, each  
30 cell having an open upper face and lower drainage opening, means adapted to receive a propagating medium and at least one seed positioned therein, said arrangement being characterised by a plurality of said individual cells being located in fixed relationship to one another to form a

prearranged group of cells, and at least two said groups of cells being hinged together by pivot means to form a cell chain.

5            Preferably the individual cells in each said group of cells are arranged in a straight line and the pivot means is such as to allow groups of cells to lie side by side in storage positions to make up a rectangular array of individual cells. Conveniently the pivot means comprises a double hinge element.

10           According to a second aspect of the present invention there is provided an arrangement of interconnected individual cells each having an open upper face and lower drainage opening means adapted to receive a propagating medium and at least one seed operatively positioned therein,  
15       said arrangement being characterised in that the open upper face of each said cell has a shape adapted to nest with adjacent cells, whereby in a storage position of said cell arrangement open space between adjacent cells is substantially avoided. Conveniently the upper open face of  
20       each said cell has a polygonal shape.

             In a further aspect of the invention there is provided a cell chain including a plurality of containers for holding seeds or seedlings and propagating medium therein the containers being interconnected by at least one  
25       link formed and located in such a way that a tooth of a toothed driving means may interengage the link and/or the containers for moving the cell chain from one point to another.

             The cross sectional shape of the containers may  
30       vary from circular, hexagonal, square or the like depending upon the desired mode of stacking and use of the invention, and the invention is not limited to any specific container shape.

             The chain can be easily produced as a plastics  
35       moulding. The containers may be formed with a bottom or alternatively, with inwardly tapered walls to prevent loss

of soil therein. The chain may be formed with a point of weakening to facilitate relative pivotal movement of the containers, and ease of breakage if necessary to divide the chain.

5       The containers may be shaped with hexagonal cross section thereby facilitating close stacking in straight lines.

10       The cell chain may consist of a series of cells or plant compartments rigidly connected to form rigid groups containing a number of cells. Each group may be pivoted at either end using a link cell which will allow the previous and the following group to pivot about each other. In this way a continuous chain of alternating cell groups and links can be concertined into a solid block of cells to allow ease  
15 of handling and storage.

      The cell chain may be broken at any point where a link cell exists.

20       The plant cells may vary in shape and size between derivatives of the cell chain. Some possibilities include conical shapes, cylinders and tapered hexagons. Provision can be made between each cell for engagement with a toothed driving means when the chain is straightened into a single strand.

25       The link cell is uniquely designed to allow the rigid cell groups to hinge in either direction but still allow the cells to nest against each other to form a pack of hexagonal cells to appear as a solid sheet of honeycomb.

30       The unique feature of the product is that in the packed configuration the container forms a rectangular mass able to maximize the use of space and fit in with standard horticultural practice in existing glass houses. When hinged apart (or straightened) the pack transforms into a single line of hinged cell groups of hexagonal cells, able to be mechanically handled at high speed in single file to  
35 select and transplant the soil block (plug) and plant at high speed.

The invention may be better understood from the following description of preferred embodiments given in relation to the accompanying drawings. In the drawings:-

Figure 1 is a perspective sketch of a hinge section  
5 between groups of connected cells of a first preferred embodiment.

Figures 2a and 2b are plan views demonstrating schematically the 'wrapping' action of the cell chain to form a solid tray.

10 Figure 3 is a plan view of rigid groups of cells forming a concertina.

Figures 4a, 4b and 4c show elevations of a rigid cell chain group.

Figures 5a, 5b and 5c show elevations of a cell  
15 chain link.

Figure 6 is a bottom perspective view showing a hinge connection region in greater detail.

Referring to Figures 1, and 4 a, b and c there is  
20 partially shown two groups 10, 11 of rigidly connected individual plant propagation cells 12 connected by a hinge element 13. Each of the cells has a polygonal, preferably regular/hexagonal open upper face 14 with a hollow body 15 tapering downwardly to a drainage opening 16 in the base of  
25 the cell. The drainage opening 16 comprises a restricted passage 17 together with a widening lower section 18.

Each group of cells 10, 11 comprise cells 12 arranged rigidly in line. The number of cells in each group may be variable. The last cell 12' in each group has a  
30 curved outer face 19 allowing for pivoting movement of the group relative to the hinge element 13 as will hereinafter be explained. The other end of the group includes a pivot connecting collar 20 enabling the group to be hingedly connected to the hinge element 13.

35 The hinge element 13 is shown in greater detail in Figures 5 a, b and c. The hinge element preferably

comprises a single propagation cell 21 with a connecting hinge collar 22 equivalent to the collar 20 of the cell groups. Thus a double pivot hinge is formed between the adjacent cell groups 10, 11. The rigid element 12 has stop means 27, 28 arranged to limit pivoting movement but  
5 permitting pivoting in both directions from the centre line of the rigidly connected cells to a degree sufficient to allow the groups of cells to lie adjacent one another in a storage position.

10 As is apparent from the Figures, the individual cells 12 are interconnected in each group by a pair of rigid webs 25, 26. The polygonal upper face of the cells are so arranged whereby adjacent groups of cells are adapted to nest into one another with substantially no space between  
15 adjacent cells. In this manner a substantially rectangular array of cells can be formed in a storage position with minimum wastage of space. There may also be provided lugs or other extending projections from between the rigid connecting webs 25, 26 to locate between adjacent webs 25,  
20 26 of a second group of propagation cells when the respective groups are positioned next to one another in a storage position. This arrangement locks the groups together so that in the storage position the open faces 14 of the individual cells are all ensured to be located in the  
25 same plane. This is best shown in Figures 2 a, b and 3.

Figure 6 shows a slightly modified form of the invention comprising a number of rigidly interconnected individual cells 12 having essentially hexagonal upper faces 14 forming rigid groups of in line cells 10 and 11. A hinge  
30 element 13 joins the two groups. The hinge element comprises a cell 21 having a base section 21 press fitted but retained for pivoting movement within a retaining ring 21b rigidly formed at the end of the group 10 of the rigidly connected cells. The hinge element 13 further includes a  
35 ring or collar 13' extending laterally from the cell 21 which press fits in a pivoting manner over the base section

12b of the end cell 12' of the rigid group of cells 11. In this manner, a double hinge connection is formed. A pair of web structures 25 and 26 hold the cells 12, 12' together and lateral projections 26' are provided between the webs and extending outwardly beyond the webs to be located within the space 26b between the webs when the groups of cells are folded to be nested into one another in side by side relationship. As will be seen in Figure 6, a pair of stop projections 27 (only one of which can be seen) are provided on a flange section 27' of the rigid element 12. The stop projections limit the rotation of the hinge element to substantially equal amounts on either side of the centre line of the group of cells 10 and 11. In other respects the embodiment of Figure 6 is essentially similar to the embodiment illustrated in Figures 1 to 5.

C L A I M S

1. An arrangement of interconnected individual cells for use in the propagation of seeds, each cell having an open upper face and lower drainage opening, means adapted to receive a propagating medium and at least one seed positioned therein, said arrangement being characterised by a plurality of said individual cells being located in fixed relationship to one another to form a prearranged group of cells, and at least two said groups of cells being hinged together by pivot means to form a cell chain.

2. The arrangement as claimed in claim 1 wherein the individual cells in each said group of cells are arranged in a straight line and the pivot means is such as to allow groups of cells to lie side by side in storage positions to make up a rectangular array of individual cells.

3. The arrangement as claimed in claim 2 wherein the pivot means comprises a double hinge element.

4. An arrangement of interconnected individual cells each having an open upper face and lower drainage opening means adapted to receive a propagating medium and at least one seed operatively positioned therein, said arrangement being characterised in that the open upper face of each said cell has a shape adapted to nest with adjacent cells, whereby in a storage position of said cell arrangement open space between adjacent cells is substantially avoided.



5. A cell chain including a plurality of containers for holding seeds or seedlings and propagating medium therein the containers being interconnected by at least one link formed and located in such a way that a tooth of a toothed driving means may interengage the link and/or the containers for moving the cell chain from one point to another.

6. Apparatus for use in propagating plants and supporting such plants for transport by toothed driving means, said apparatus comprising a plurality of containers open at each end each of which forms a compartment for seeds or seedlings and a propagating medium for propagating a seedling in the container and permitting the germinated seedling and associated propagating medium to be transplanted intact from the compartment; a set of lugs carried by each of said containers and projecting laterally from opposite sides thereof to confront lugs of an adjacent container; means coupling the confronting lugs of adjacent containers to form an interlocked chain of containers, said lugs spacing adjacent containers from one another and forming therebetween a gap of such size as to accommodate a tooth of said driving means; wherein said lugs connect a plurality of said compartments to form a substantially rigid group of compartments and intermediate hinge means for pivoting interconnecting groups of said compartments together.

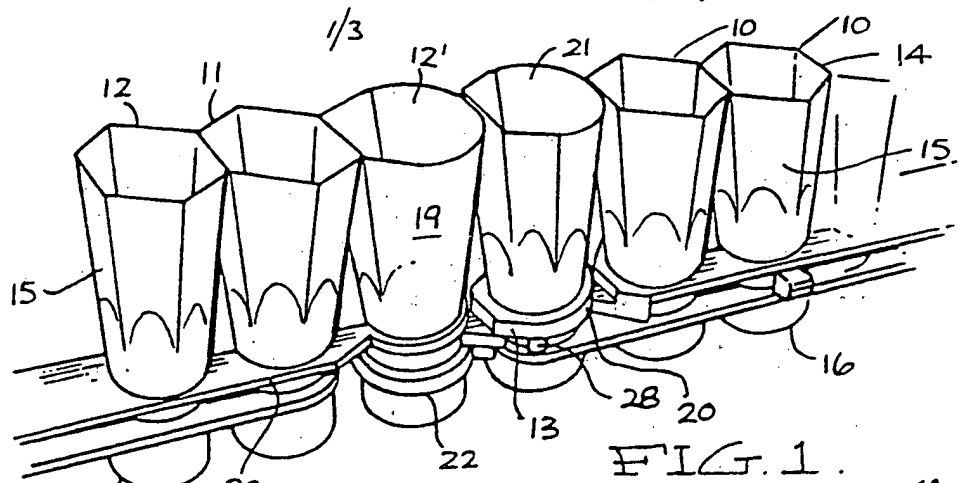


FIG. 1.

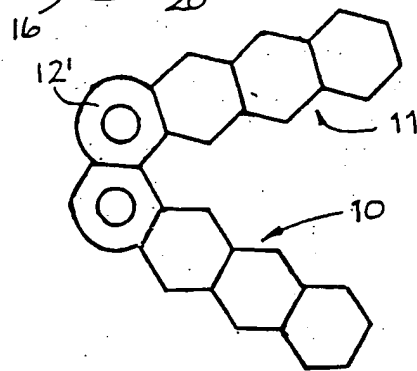


FIG. 2a.

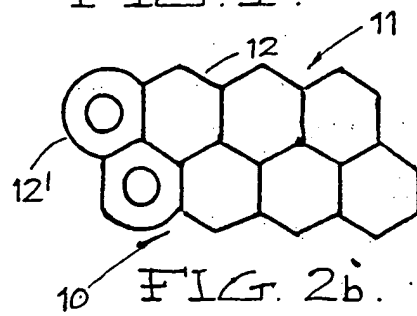


FIG. 2b.

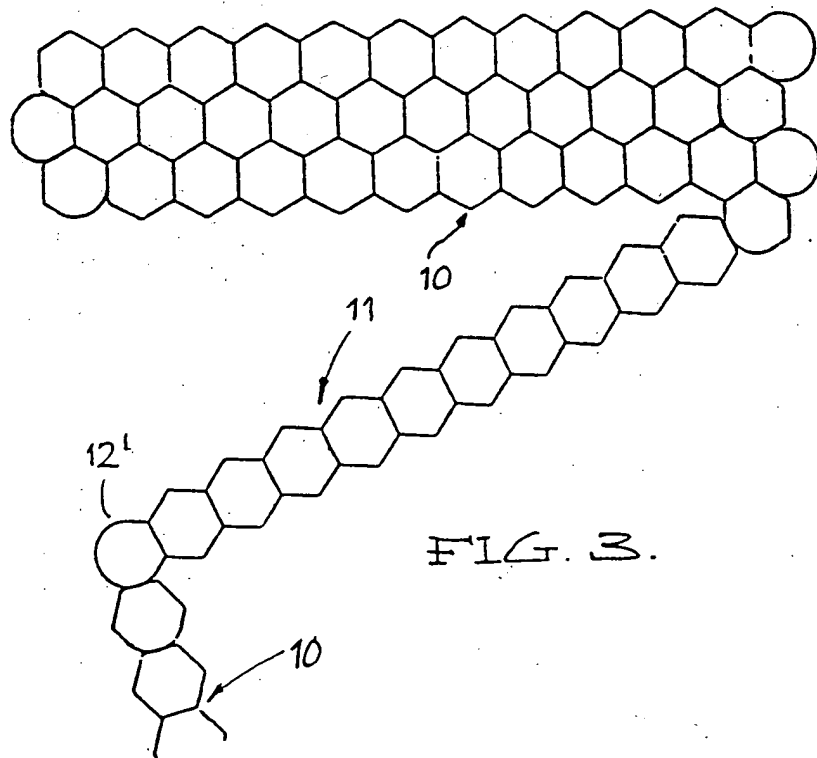


FIG. 3.

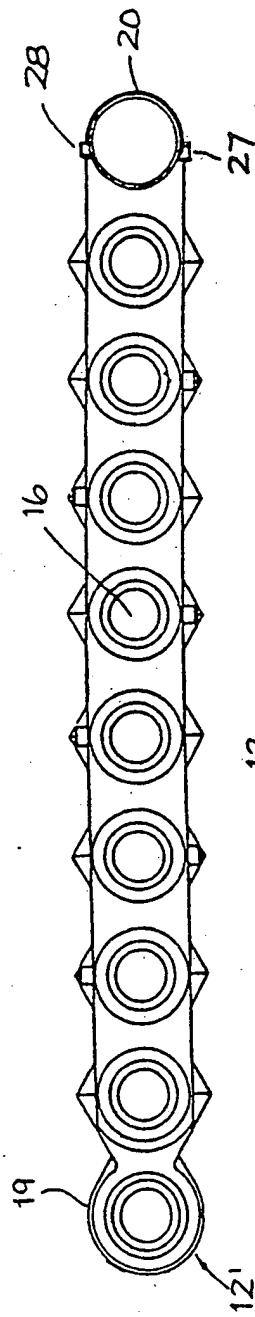


FIG. 4A.

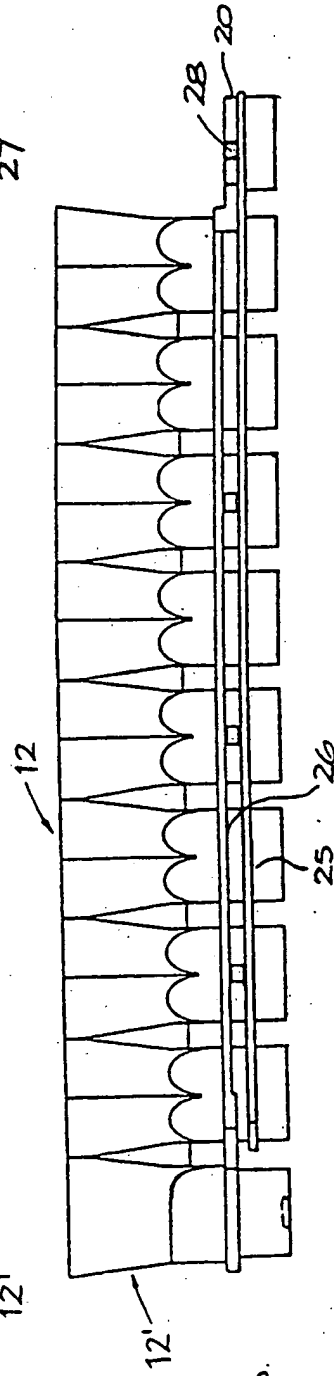


FIG. 4B.

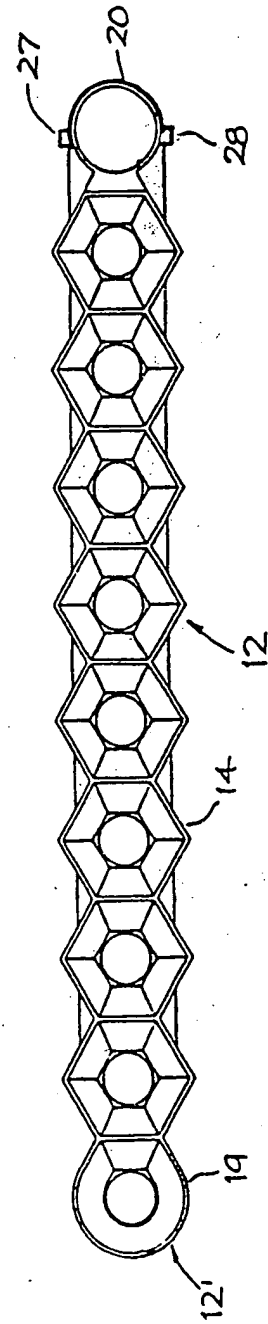


FIG. 4C.

